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PLANETARY PHENOMENA FOR JANUARY AND FEBRUARY, 1905.

By Malcolm McNeill.

PHASES OF THE MOON, PACIFIC TIME.

New Moon,	Jan.	5,	10h 17m A.M.	New Moon,	Feb.	4,	3h 6m A.M.
First Quarter,	"	13,	12 11 P.M.	First Quarter,	"	12,	8 20 A.M.
Full Moon,	"	20,	11 14 P.M.	Full Moon,	"	19,	10 52 A.M.
Last Quarter,	"	27,	4 20 P.M.	Last Quarter,	"	26,	2 4 A.M.

The first of the four eclipses of the year will occur on February 19th, and will be a partial eclipse of the Moon. It will be visible generally throughout the eastern hemisphere, but not in the western. The maximum obscuration will be a little less than one half of the Moon's diameter.

Mercury will be a morning star throughout January and February. It passes inferior conjunction with the Sun December 31, 1904, reaches greatest western elongation on January 22d, and will come to superior conjunction on March 9th. It is too close to the Sun to be seen on January 1st, but rapidly increases its distance, so that it rises more than an hour before sunrise before the middle of the month. During the latter half of January the interval is never less than an hour. After February 1st the interval becomes much shorter, and the planet is too close to the Sun for naked-eye observations after the first few days of the month. The greatest elongation, on January 22d, is 24°. This is rather greater than usual, as the planet is then within a short distance of aphelion, which comes on February 9th.

Venus continues as an evening star, remaining above the horizon about three and one half hours after sunset on January 1st, and this interval increases to nearly four hours during February. It reaches its greatest east elongation, 46° 41′, on February 14th. The part of the ecliptic in the neighborhood of the planet is much nearer the pole than the place occupied by the Sun, and this makes the interval between the setting of the Sun and the setting of the planet much greater than it is usually at the period of greatest elongation. During the two months' period the planet moves about 57° eastward and 20°

northward from *Capricorn* through *Aquarius* and *Pisces* to the extreme eastern part of the latter constellation. On the morning of February 3d it is very near the vernal equinox. The actual distance of the planet from the Earth diminishes quite rapidly, and there is consequently a marked increase in brightness, but the planet will not attain its maximum brilliancy until near the end of March.

Mars rises at 1:15 A. M. on January 1st and at 11:35 P. M. on February 28th. It moves about 25° eastward and 8° southward from a point in *Virgo* a little east and north of *Spica, α Virginis,* to the eastern part of *Libra,* and at the close of February will be about 18° west and north of *Antares, α Scorpii.* Its actual distance from the Earth diminishes about fifty-five millions of miles between January 1st and February 28th, and at the latter date its distance from us is about the same as Earth's mean distance from the Sun. This causes the planet to increase about two and one half times in brightness from January 1st to February 28th. *Mars* will thus be quite a conspicuous object, although from February to the time of opposition in May the gain will be in a still greater ratio.

Next to *Venus, Jupiter* is the brightest object in the evening sky. It sets at about 1 A. M. on January 1st, and at a little before 10 P. M. on February 28th. It is therefore well placed in the southwestern sky for evening observation. It moves about 7° eastward and 3° northward in the eastern part of *Pisces,* and at the end of February it is only about 5° east and south of *Venus.* The two planets will be in conjunction early in March.

Saturn will also be an evening star during the greater part of the period; but is much lower down and apparently nearer the Sun than *Jupiter* is. It may, however, be easily seen in the evening twilight throughout January. It sets about three hours after sunset on January 1st, and only about an hour after on February 1st. It comes to conjunction with the Sun, and changes from an evening to a morning star, on February 12th, but does not reach a great enough distance from the Sun by the end of the month to be seen with the naked eye.

Uranus is a morning star very close to the Sun on January 1st, but gradually increases its apparent distance from that body, so that by the end of February it rises about three hours before sunrise. It moves about 3° eastward in *Sagittarius,* and

is a short distance north of the "milk-dipper" group in that constellation.

Neptune passed opposition with the Sun toward the end of December, and is therefore above the horizon during most of the night. It is in the western part of *Gemini,* and moves about 1° westward during the two months.

I.—A PROPOSED METHOD FOR THE MEASUREMENT AND REDUCTION OF SPECTROGRAMS FOR THE DETERMINATION OF THE RADIAL VELOCITIES OF CELESTIAL OBJECTS.

II.—APPLICATION TO A STUDY OF THE VARIABLE STAR *W SAGITTARII.**

INTRODUCTION.

Beginning thirty-five years ago, when HUGGINS and VOGEL first made application of DOPPLER'S principle to the determination of radial velocities of stars, the methods employed in this work have been developed until at present an efficient and practically uniform system has been adopted in the various astrophysical observatories. In 1888, when the attempt was made at Potsdam to record photographically the displacement of lines in the stellar spectra, the problem was placed on a firm basis. Subsequently, through improvement in the construction of spectrographs, a more accurate knowledge of the wave-lengths of spectral lines, and signal advances in the methods of measurement and reduction of the spectrograms, the results have attained their present degree of accuracy. The probable error of 22^{km} per second for an average case of velocity determination with the older methods has been reduced to a few tenths of a kilometer at the present time.

Flexure and temperature change during exposure may be said to play no part in the performance of the modern properly equipped spectrograph, and other observational

* Dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the University of California. (Abstract. Complete paper published as *L. O. Bulletin*, Number 62.)